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A MECHANICALLY OPERATED INSECT TRAP

L. G. Schoenleber and B. J. Landis[1]

Insect traps are valuable research tools for determining when infestations occur and which species of insects are present. Insects can be controlled more readily when their populations, species, and flight habits are known.

The trap described in this publication was designed for use by entomologists to study the flight habits of insects, particularly the green peach aphid, Myzus persicae (Sulzer). This report describes its design, construction, and operation. The trap consists essentially of (a) a baffle, painted chrome yellow to attract aphids, (b) a collection device, (c) a mechanically operated device to collect insects in separate containers for specified time periods, and (d) a mounting frame.

HOW TRAP OPERATES

The trap operates on the principle that certain insects are attracted to a yellow painted surface. Insects fly against one of the four yellow baffle plates, then fall through a concentration funnel into a 4-oz. glass bottle containing a preservative. Twenty-eight bottles are placed in holders near the edge of a turntable. At the end of each hour, a clock mechanism operates a release mechanism to allow a torque-loaded turntable to rotate, so that a different bottle moves into the collection position. The trap will operate at least 24 hours before servicing is required.

TRAP-DESIGN REQUIREMENTS

The trap was designed so that it would:

1. Attract and catch insects, particularly the green peach aphid.
2. Collect insects and hold them for later identification.
3. Collect insects in such manner that they will not be mutilated or destroyed.
4. Be usable all year round in all kinds of weather (rain, wind, low and high temperatures).
5. Be suitable for use in remote locations, with self-contained mechanical power.
6. Collect insects in a separate container each hour.
7. Include from 24 to 30 containers.
8. Have adjustment for raising or lowering trap from ground.
9. Have attachment to cover trap if needed to protect from wind and rain.
10. Require servicing only once each day.
11. Be compact, easily moved and assembled.
12. Have windows for viewing the catch of insects.

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DESIGN, CONSTRUCTION, AND ASSEMBLY

An assembled trap ready for use is shown in figure 1. It is mounted on a wooden platform which is staked rigidly to the ground. The painted baffles are adjusted in the lowest position to catch low-flying insects. The funnel and cover plate shown in figure 2 are in a lifted position away from the collecting bottles, to provide a view of the arrangement for the various parts. Detail and assembled drawings of the trap are shown in plates 1 through 10.

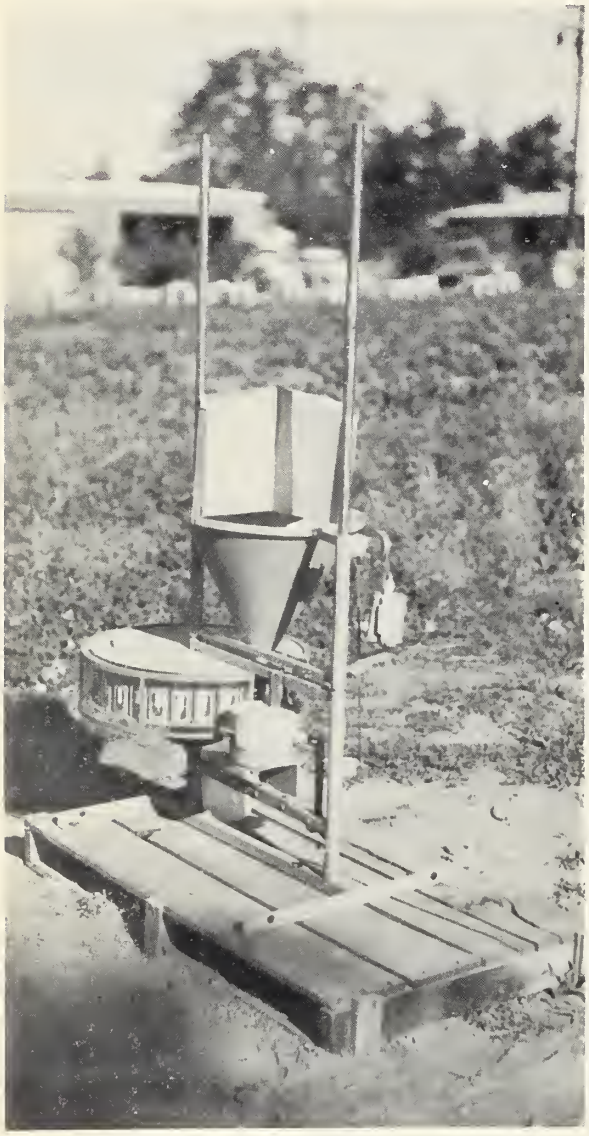


Figure 1.--Insect trap in operation.

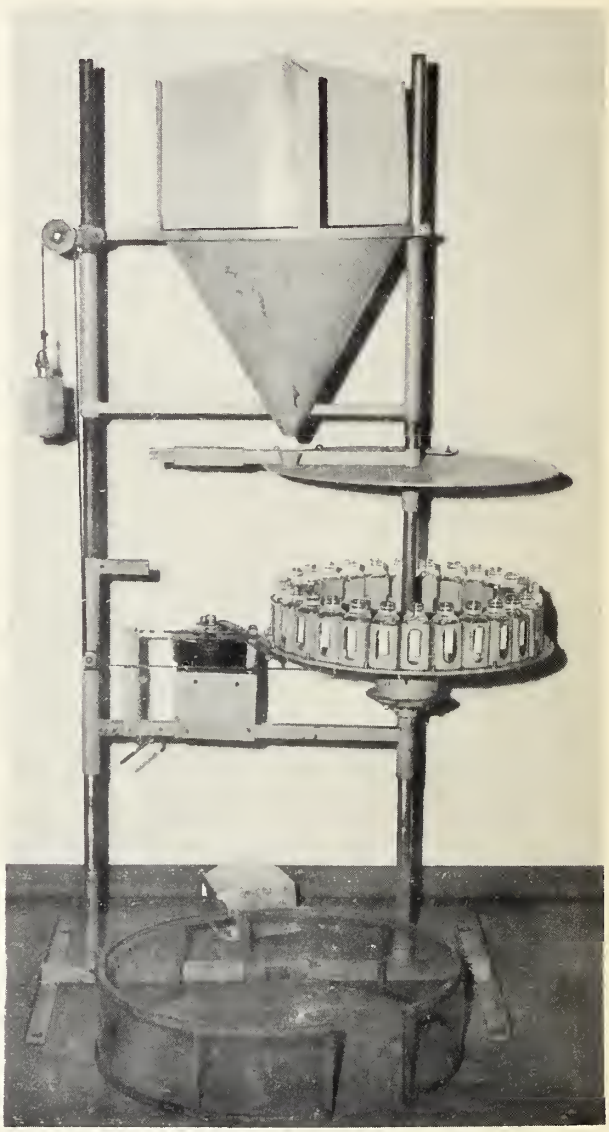


Figure 2.--View of insect trap partially assembled.

PRECAUTIONS FOR PROPER TRAP OPERATION

- Clearance between the bottles and cover plate should be a minimum 1/32 to 3/64 inch; otherwise, losses of insects may occur. The bottles must not rub on the cover plate or the table will not rotate properly.

- Make the turntable and cover plate flat in a way to prevent warping.

ASSEMBLED INSECT TRAP

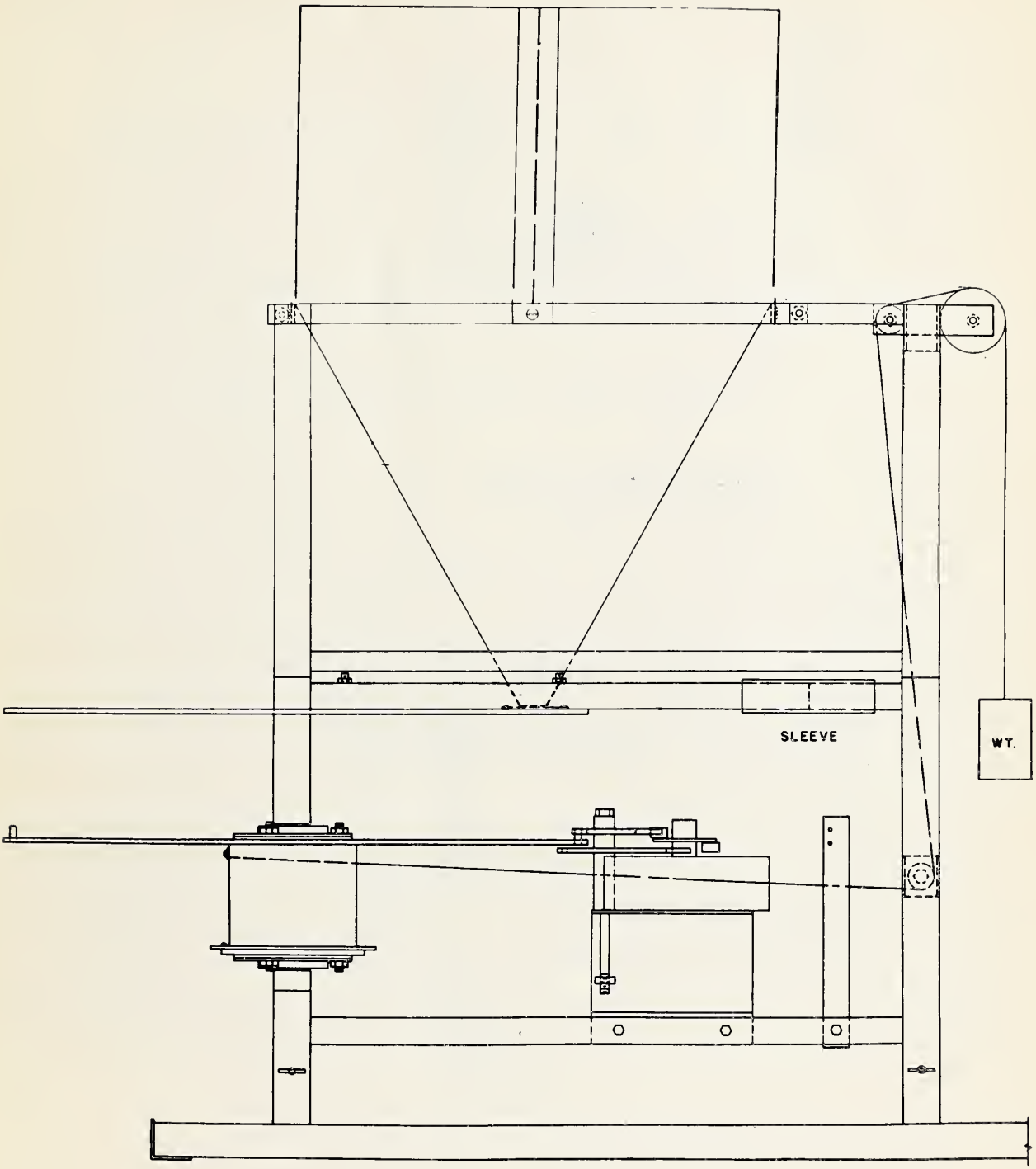
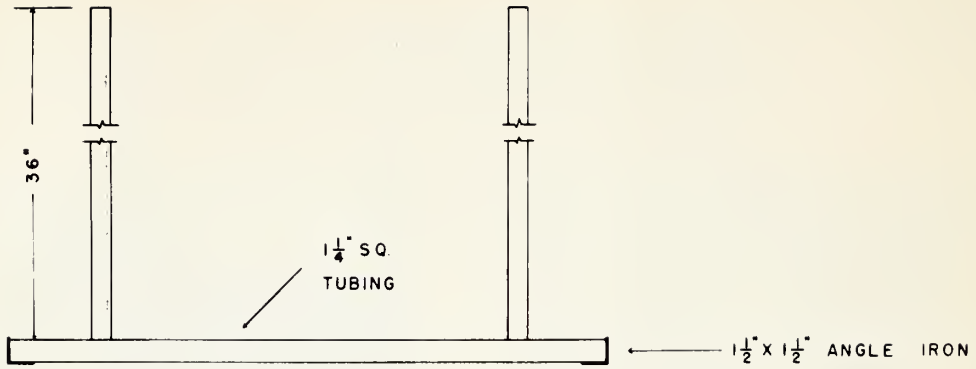


PLATE 1

SUPPORT BASE SIDE VIEW



SUPPORT BASE TOP VIEW

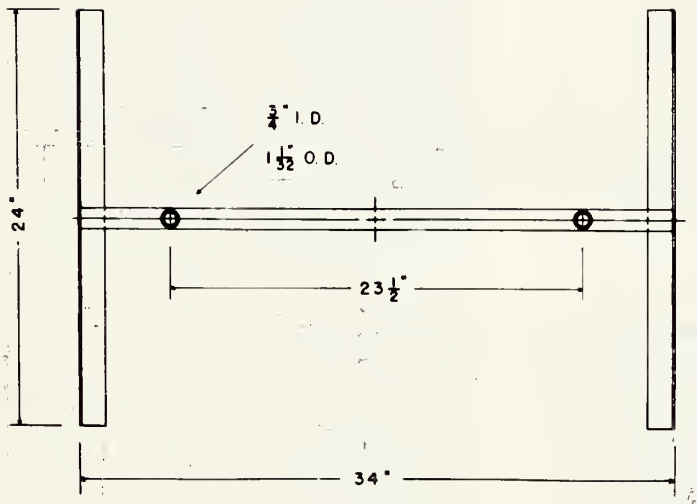
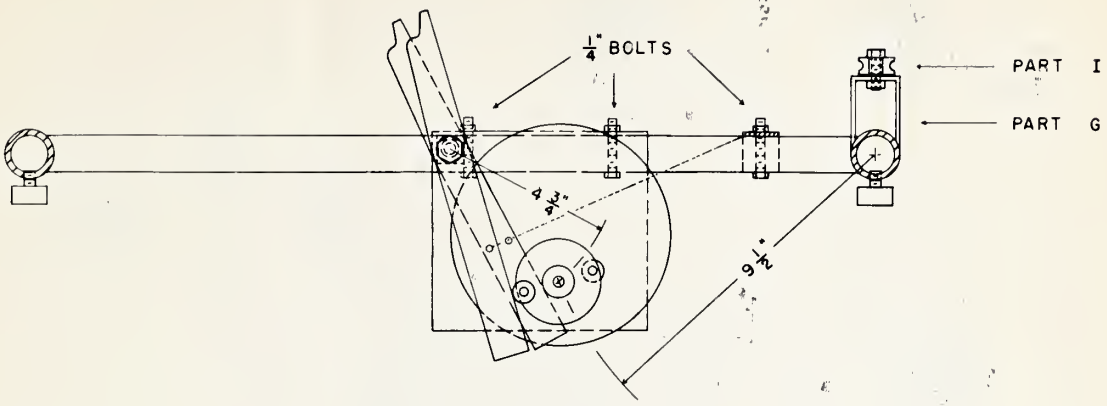


PLATE 2

CLOCK ASSEMBLY ON MAIN FRAME TOP VIEW



CLOCK ASSEMBLY ON MAIN FRAME SIDE VIEW

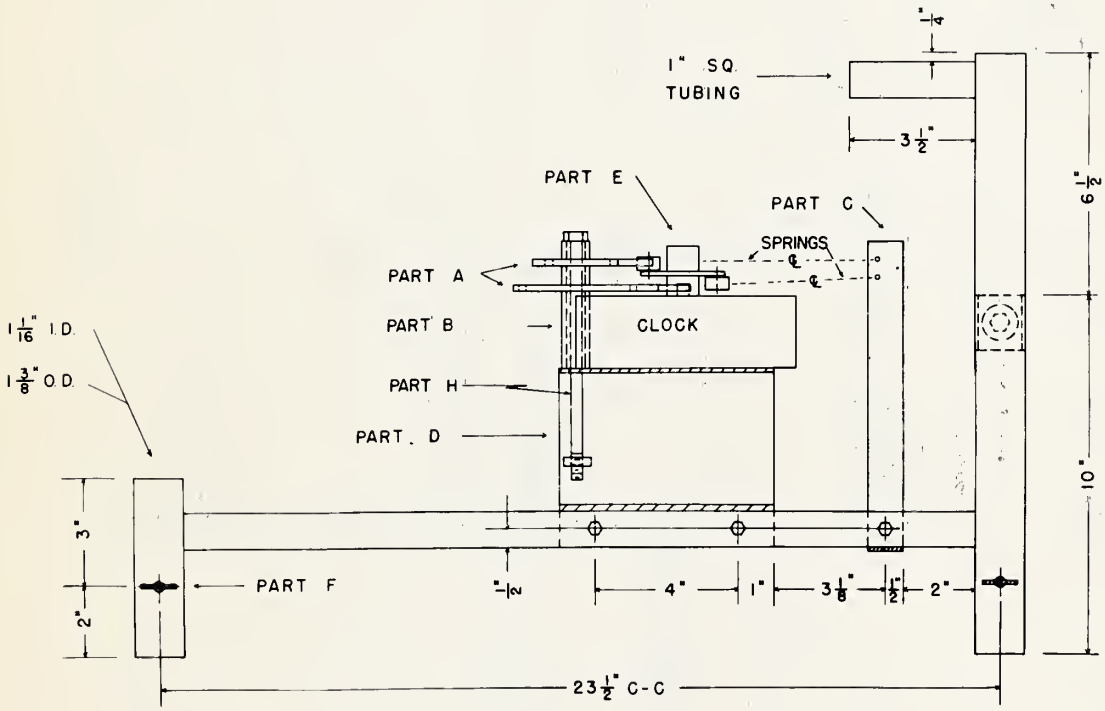
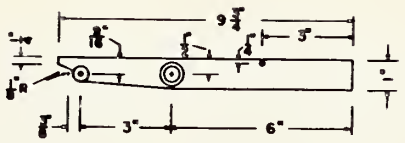


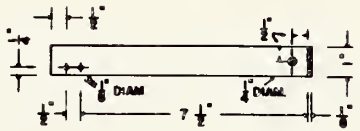
PLATE 3

PART A TOP VIEW

PART B TOP VIEW

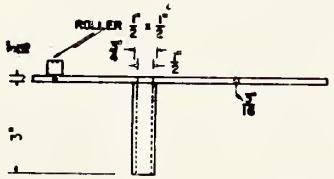


PART C FRONT VIEW

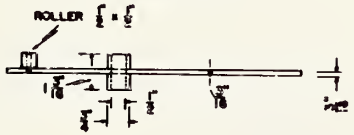


PART E TOP VIEW

PART A SIDE VIEW

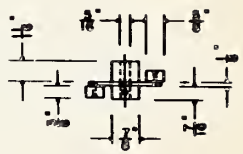


PART B SIDE VIEW



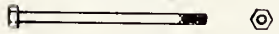
PART C SIDE VIEW

PART E SIDE VIEW

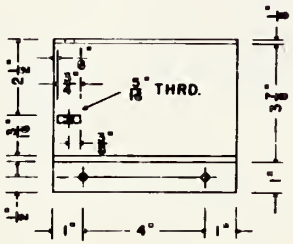


PART H

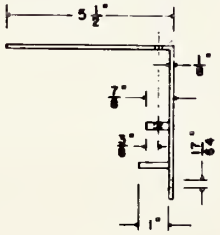
BOLT $\frac{5}{16}$" × 6 $\frac{1}{2}$"



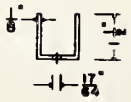
PART D FRONT VIEW



PART D SIDE VIEW



PART G TOP VIEW



PART F TOP VIEW

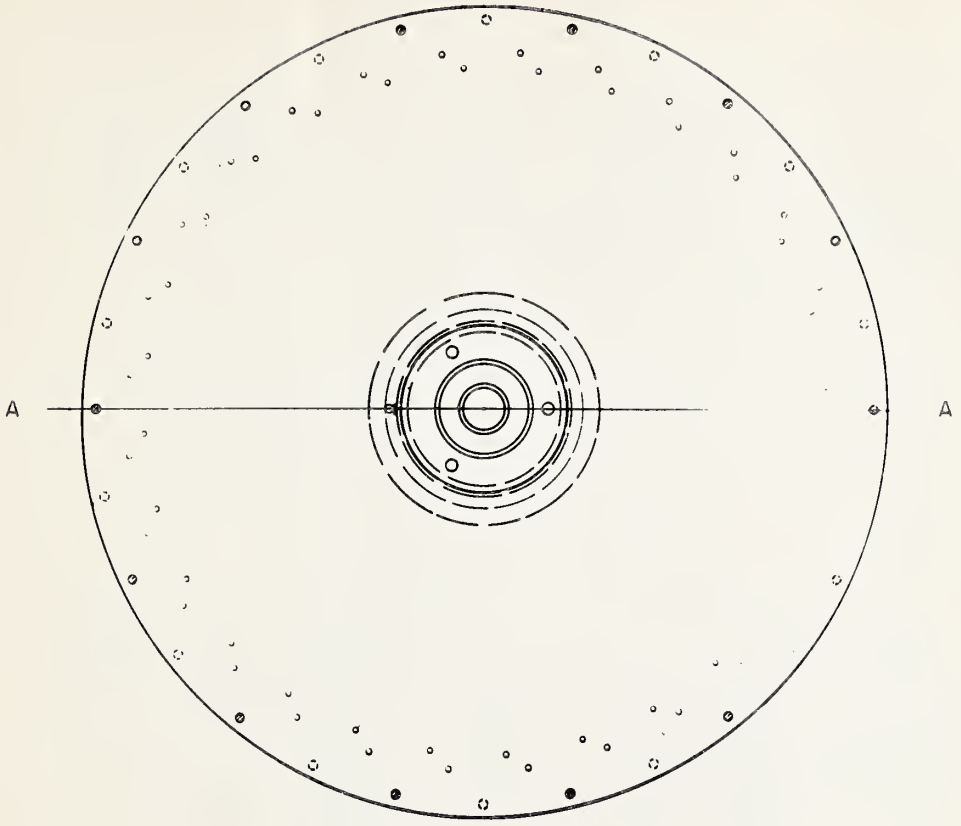
PART F SIDE VIEW

PART I

PART G FRONT VIEW

PLATE 4

TURNTABLE ASSEMBLY



SIDE VIEW PLANE AA

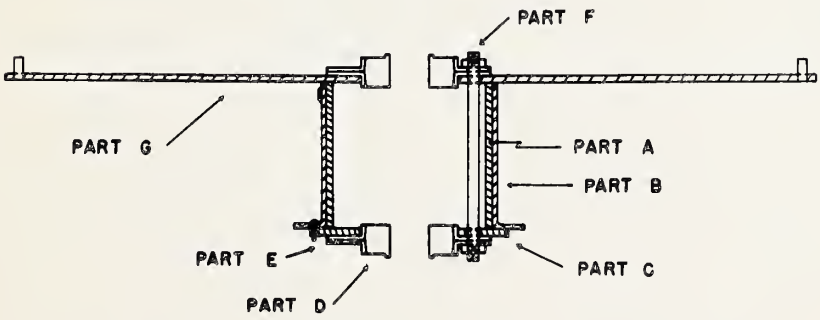
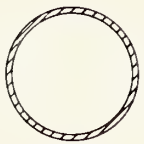
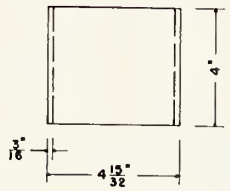


PLATE 5

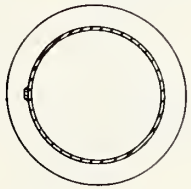
PART A TOP VIEW



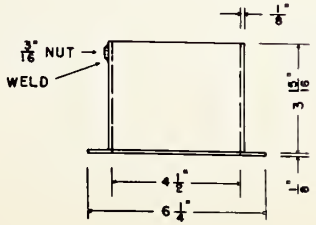
PART A SIDE VIEW



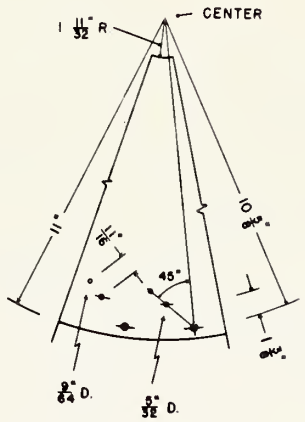
PART B TOP VIEW



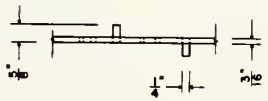
PART B SIDE VIEW



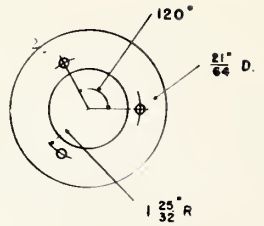
SECTION PART G
TOP VIEW



SECTION PART G
SIDE VIEW



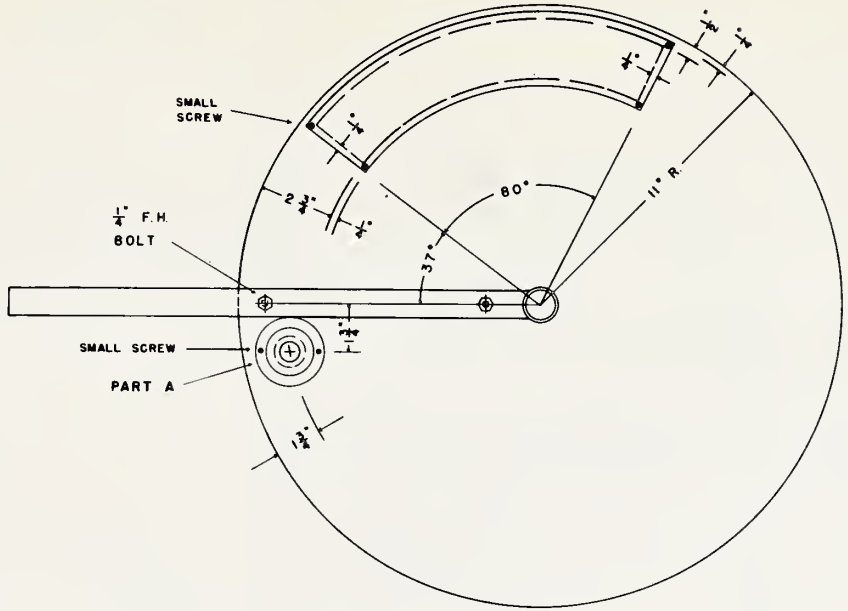
PART C TOP VIEW



PART C SIDE VIEW

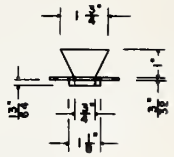
PLATE 6

TURNTABLE COVER TOP VIEW



PART A
TOP VIEW

PART A
SIDE VIEW



TURNTABLE COVER SIDE VIEW

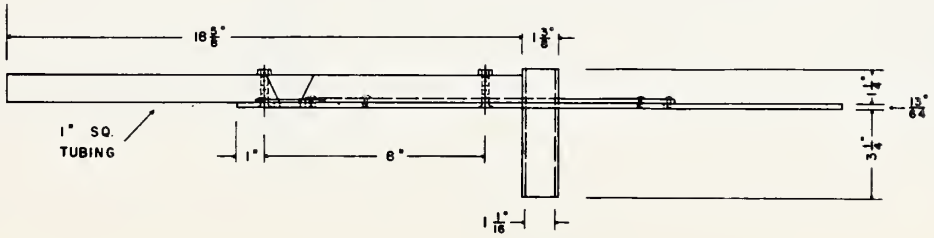
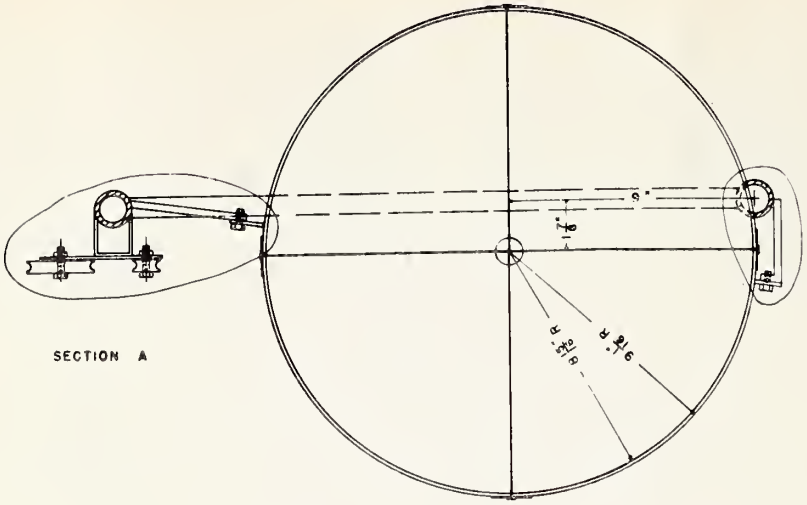


PLATE 7

HOPPER AND FRAME TOP VIEW



HOPPER AND FRAME SIDE VIEW

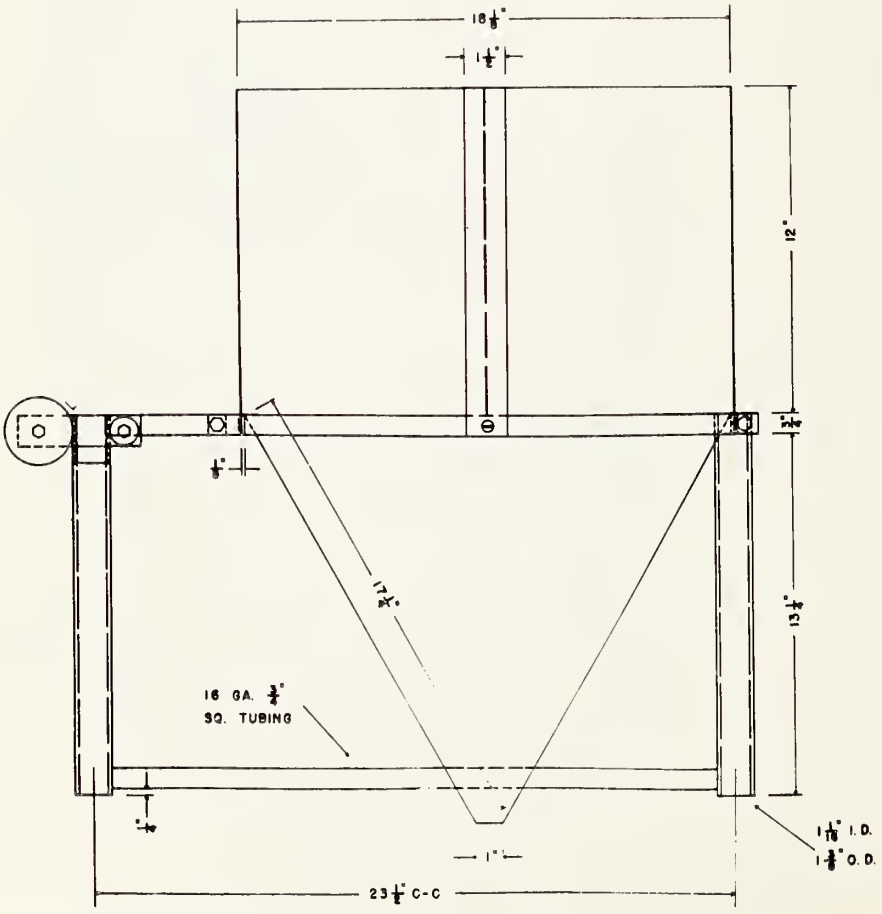
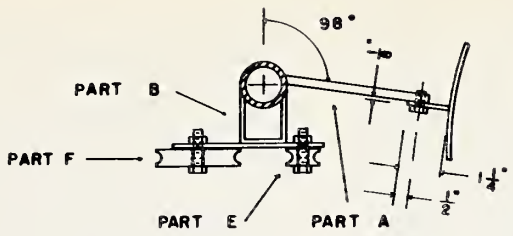
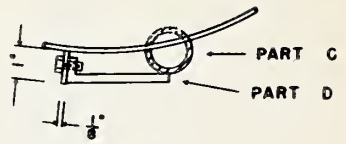


PLATE 8

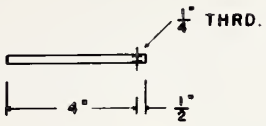
SECTION A



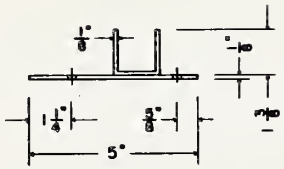
SECTION B



PART A TOP VIEW



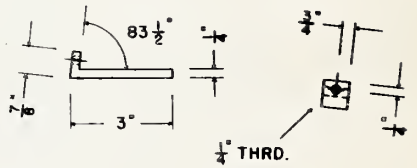
PART B TOP VIEW



PART D

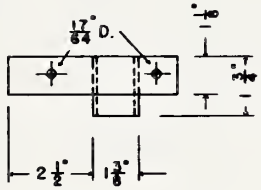
TOP VIEW

SIDE VIEW



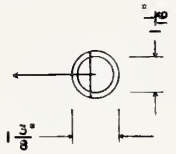
PART A SIDE VIEW

PART B SIDE VIEW



PART C TOP VIEW

TO CENTER



PART C SIDE VIEW

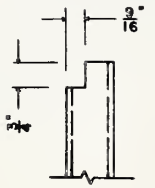
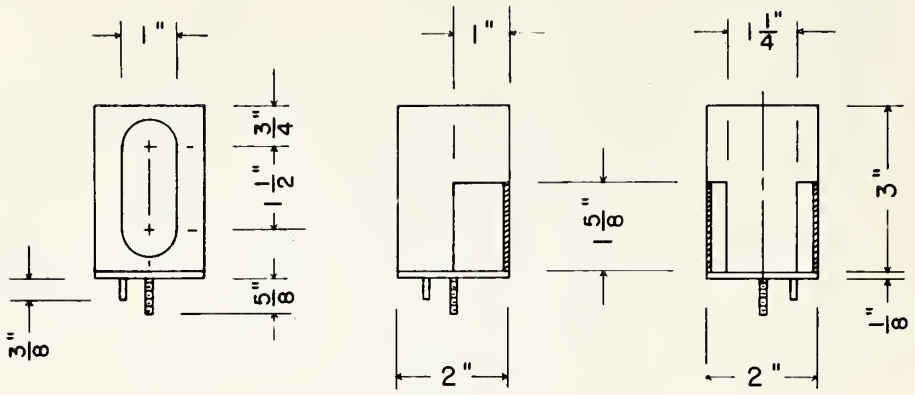


PLATE 9

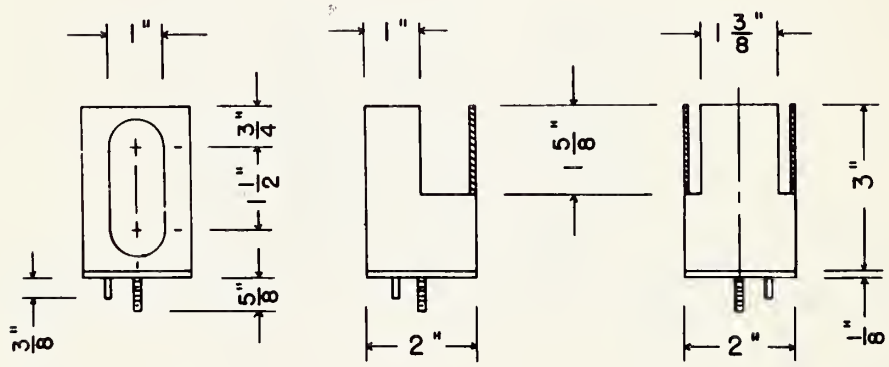
TYPE A BOTTLE HOLDER

FRONT SIDE BACK



TYPE B BOTTLE HOLDER

FRONT SIDE BACK



BOTTOM

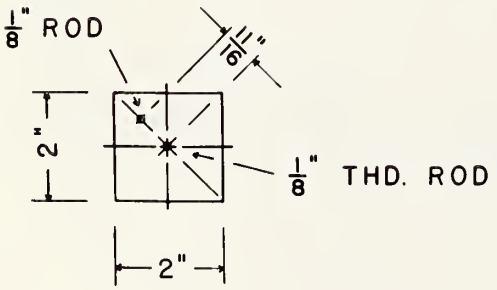


PLATE 10

- The outside cover should clear the turntable to prevent rubbing.

- Spring tension on the trip arms should not be excess or it will prevent the low-powered clock from operating properly.

- The trip arms in a holding position to prevent turntable rotation must be 1/32 to 1/16 inch beyond dead center. This will prevent the turntable from getting out of time.

- To insure optimum performance of the insect trap, the clock case should be sealed to exclude dust and moisture.

- Glass bottles should be of the same size. Gaging each bottle before use can prevent later trouble in trap operation.

- The trap should be staked to the ground with the turntable rotating in a horizontal position to prevent misalinement or movement by wind.

- All moving parts must be kept free of rust when exposed to wet weather and moisture condensation.

- Liquid used in the collection bottles for preserving the insects during trap operation should be nonevaporative during hot weather and free flowing during freezing weather. A 3-percent formaldehyde solution was used in the summer and an automotive antifreeze solution in the winter.

INSECTS CAUGHT IN TRAP

During a 6-month period starting in May 1967, over 8,300 insects were caught. This occurred with the trap located at the Yakima, Wash., USDA experiment plot area and in orchards in the immediate vicinity. The highest number of insects caught in any 1-hour period was 314.

Many kinds of insects were attracted to the yellow baffle plates. Possibly, some insects were captured because of random flights.

The species of insects captured and identified are listed below. A small number of insects captured were not identified.

Aphids:

Acyrthosiphon solani (Kaltenbach)
Nearctaphis bakeri (Cowen)
Aphis fabae Scopoli
Aphis pomi DeGeer
Brachycaudus persicae (Passerini)
Brevicoryne brassicae (L.)
Cavariella aegopodii (Scopoli)
Eriosome crataegi (Oestlund)
Hyperomyzus lactucae (L.)
Macrosiphum euphorbiae (Thomas)
Myzocallis robiniae (Gillette)
Myzus persicae (Sulzer)
Ovatus crataegarius (Walker)
Pemphigus spp.
Phorodon humuli (Schrank)
Rhopalosiphoninus latysiphon (Davidson)
Rhopalosiphum fitchii (Sanderson)
Hyadaphis pseudobrassicae (Davis)

Other insects:

Aphodius spp.
Aleyrodes spiracoides Quaintance
Apis mellifera L.
Meloidae
Carabidae
Thaumatomyia glabra (Meigen)
Coccinella transversoguttata Falderman
Crioceris asparagi (L.)

Pyrrhalta luteola (Muller)
Geocoris spp.
Hippodamia convergens Guérin - Méneville
Kenolla Confluens (Uhler)
Lachesella pedicularia (L.)
Lygus spp.
Melanopthalma americana (Mannerheim)
Cicadellidae
Nabidae
Negastrius gentilis (Le Conte)
Orius tristicolor (White)
Anthocoris spp.
Pentatomidae
Reduvidae
Scymnus spp.
Staphylinidae

MATERIALS[2]

1 clock with metal case. Taylor Instrument Co., Rochester, N.Y. No. 83S98-5C, metal case and cover No. 83-818OK. Instrument-type clock with 24-hour spring wind, 2 hours per revolution of drive shaft. Drive shaft rotates clockwise when facing shaft. Clock mechanism is conditioned for low temperature. Plate 3.

28 screw-top glass bottles and caps. Bottles 1 1/4 in. square, 4 3/8 in. tall with 3/4-in.-diameter opening, 4-oz. capacity. (Caps are needed to retain contents when bottles are removed from insect trap.) Figure 1.

8 feet 1/4-in. nylon cord. Figure 1.

2 bearings, Fafnir #RA 1 1/16-in. with flangette sideplates. Part D, Plate 5.

2 coil-tension springs, 6 1/2 in. long, 1/4 in. outside diameter, 1/32-in. diameter wire, 30 coils per inch. Plate 3.

1 two-pound weight with hook, for rotating turntable. Figure 1.

1 pint chrome yellow implement enamel, for baffles and inside of cone.

1 quart gray paint, for trap parts not painted yellow.

2 steel pipe caps, 3/4-in. standard pipe. Plate 2 (caps shown welded to base).

3/4-in. standard pipe, threaded ends. 72 in. long for two frame members, Plate 2.

Steel tubing, 3/4 in. O.D. x 1/2 in. I.D.[3] x 4 3/16 in. long for 2 pieces. Parts A and B, Plate 4.

Steel tubing, 1 3/8 in. O.D. x 1 1/16 in. I.D. x 26 1/4 in. long for 3 pieces. Plates 3 and 7.

Steel tubing, 4 1/2 in. O.D. x 4 in. I.D. x 4 in. long. Part A, Plates 5 and 6.

Steel tubing, 4 3/4 in. O.D. x 4 1/2 in. I.D. x 3 15/16 in. long. Part B, Plates 5 and 6.

Steel tubing, square, 3/4 in. x 1/16 in. wall x 44 1/4 in. long for 2 pieces, Plate 8.

Steel tubing, square, 1 in. x 1/16 in. wall x 44 1/4 in. long for 3 pieces. Plates 3 and 7.

Steel tubing, square, 1 1/4 in. x 1/16 in. wall x 34 in. long. Plate 2.

Steel tubing, square, 1 1/4 in x 1/8 in. wall x 6 in. long. Plate 1.

Steel tubing, square, 2 in. x 3/32 in. wall x 84 in. long for 28 holders. Plate 10.

Steel bar, 2 1/2 in. diameter x 1 5/8 in. long. Part A, Plate 7.

Sheet metal, 26 gage, 36 1/2 in. x 36 1/2 in. (one piece), for cone. Plate 8.

Sheet metal, 26 gage, 12 in. x 12 in. (4 pieces), for deflectors. Plate 8.

Angle steel, 1 1/2 in. x 1 1/2 in. x 1/8 in. x 48 in. long for 2 pieces. Plate 2.

Flat steel, 1/8 in. x 3/4 in x 58 3/4 in. for cone band and rim brackets. Plates 8 and 9.

Flat steel, 1/8 in. x 1 in. x 14 1/2 in. for 2 pieces. Part C, Plate 4; Part B, Plate 9.

Flat steel, 1/8 in. x 1 1/2 in. x 4 3/4 in. Part G, Plates 3 and 4.

Flat steel, 1/8 in. x 1 3/4 in. x 4 in. Part B, Plate 9.

Flat steel, 1/8 in. x 2 in. x 56 in. for 28 pieces. Plate. 10.

Flat steel, 1/8 in. x 2 3/8 in. x 2 3/8 in. Part E, Plates 3 and 4.

Flat steel, 1/8 in. x 4 5/8 in. x 14 in. Plate 7.

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[2] Mention of a proprietary product does not constitute a guarantee or warranty of the product by the United States Department of Agriculture and does not imply its approval by the Department to the exclusion of other products that may also be suitable.

[3] O.D. is outside diameter, I.D. is inside diameter.

Flat steel, 1/8 in. x 6 1/4 in. x 6 1/4 in., for ring. Part B, Plates 5 and 6.
Flat steel, 1/8 in. x 6 in. x 10 1/2 in. Part D, Plate 4.
Flat steel, 3/16 in. x 1 in. x 25 1/2 in., for 3 pieces. Parts A, B, and D., Plate 4.
Flat steel, 3/16 in. x 5 3/8 in. x 5 3/8 in., for ring. Part C, Plates 5 and 6.
Flat steel, 3/16 in. x 22 in. x 22 in. for disc. Part G, Plates 5 and 6.
Flat steel, 1/4 in. x 3/4 in. x 8 3/8 in. Parts A and D, Plate 9.
2 round head stove bolts, 1/8 in. NC[4] threads, 9/32 in. long. Part A, Plate 7.
4 round head stove bolts, 3/16 in. NC threads, 5/16 in. long. Plate 7.
1 round head stove bolt, 3/16 in. NC treads, 3/4 in. long. Part B, Plate 6.
4 flat head stove bolts, 3/16 in. NC threads, 3/4 in. long. Parts A, B, and E, Plates 3 and 4.
2 flat head stove bolts, 1/4 in. NC threads, 1 1/2 in. long, Plate 7.
1 machine bolt, 1/4 in. NC threads x 3/4 in. long. Plate 9, Section A and B.
6 machine bolts, 1/4 in. NC threads x 1 in. long. Plates 3 and 9.
3 machine bolts, 1/4 in. NC threads x 1 1/2 in. long. Plate 3.
2 wing bolts, 5/16 in. NC threads, 1 in. long. Part F, Plates 3 and 4.
1 machine bolt, 5/16 in. NC threads x 6 1/2 in. long. Part H, Plates 3 and 4.
28 steel pins, 1/8 in. diameter, 1/2 in. long. Plate 10.
28 stud bolts, with nuts, 1/8 in. NC threads x 3/4 in. long. Plate 10.
28 stud bolts, 1/4 in. NC threads, 5/8 in. long. Plates 5 and 6.
3 stud bolts, with nuts, 5/16 in. NC threads x 5 1/2 in. long. Part F, Plate 5.
1 tinner's rivet, 3/16 in. x 3/8 in. Part E, Plate 5.
1 set screw, 3/16 in. NC threads, 1/4 in. long. Part E, Plates 3 and 4.
4 bronze rollers, 5/8 in. O.D., 3/16 in. I.D., 3/8 in. long. Parts A, B, and E, Plates 3 and 4.
2 grooved rollers, 1 in. O.D., 3/8 in. I.D., 1/2 in. wide. Part I, Plates 3 and 4; Part E, Plates 8 and 9.
1 grooved roller, 2 1/2 in. O.D., 3/8 in. I.D., 1/2 in. wide. Part F, Plates 8 and 9.
3 bronze bushings, 3/8 in. O.D., 1/4 in. I.D. x 9/16 in. long. Part I, Plates 3 and 4; Parts E and F, Plates 8 and 9.

BIBLIOGRAPHY

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[4] NC is National Coarse.

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